to the east attended by violent NE. and ESE. gales on the Middle and South Atlantic coasts. The gradient increased rapidly in the northeast quadrant on the 21st, as the lowest pressure passed over the Middle States and along the New England coast, causing heavy snow from the Northeast coast westward over the Lake region, and rain changing to snow and sleet from southern New England southwestward to Texas. Cautionary Signals were displayed in advance of this storm at the stations on the Atlantic coast and succeeding reports show it to have been the most severe storm of the month. The wind reached a velocity of 40 miles per hour at New York City and much damage to property was reported in that vicinity, especially to the telegraph lines which were damaged to such an extent as to interrupt communications with other cities. The tri-daily telegraphic reports of this office were missing from the northern districts, and for several days were sent from New York by rail to the first telegraph station south in communiction with Washington. The Boston observer reports a velocity of 44 miles NE., wind violent from 1:30 p. m. to following morning and a sudden gust of 60 miles—communication of all kinds obstructed, the greatest damage occurring to telegraph lines, snow-fall from 12 to 14 inches, losses estimated at $100,000. New York City reports this as the most violent storm of the season. At Ashbury, N. J., the "Mammoth Hotel" in course of construction, demolished by gale which reached a velocity of 80 miles during the afternoon. Many losses occurred on the New Jersey coast. The maximum velocity at Eastport was 40 miles NE.; at Portland, 35 NE.; Wood's Holl, 42 E.; Sandy Hook, 45 NE.; Del. Breakwater, 52 N.; Kittyhawk, 49 SW.; Hatteras, 40 SW. The centre of lowest pressure passed to the east south of Halifax, after leaving the New England coast.

No. VIII.—This depression passed east from the Pacific over Washington Territory on the 28th, causing heavy rains and damaging floods in that region. The rains extended over California on the night of the 28th and continued during the remainder of the month as the severest storm in that region for many years. The unusual rain-fall and damage resulting from floods caused by this storm are noticed under the proper heading. The rains continued on the Pacific coast after the centre of depression had passed to the east of the Rocky Mountains, near the northern boundary of Idaho. The area passed over the Missouri valley and the Lake region during the 29th and 30th with the high average velocity of 47 miles per hour, but the pressure at the centre increased as it approached the Atlantic, and it disappeared as a cyclonic disturbance before reaching the New England coast.

No. IX.—This storm is marked on the chart as first central in northern Texas at midnight of the 30th, but it is probable that it passed from the Pacific coast or that its development was due to the heavy rain in that region on the previous day. The course of the centre after its first appearance was to the northeast until the centre reached the Ohio valley as a well defined storm, accompanied by very heavy rain near the central area, which, at that time, was marked by a small elliptical isobar of 29.80, central near Louisville at the 11 p. m. report of the 31st. The succeeding reports show that the direction of the area changed slightly on the following day, and that it passed off the South Atlantic coast, causing dangerous winds as far north as Boston. Cautionary Signals were ordered in advance of this storm at stations north of Ft. Macon, N. C. The maximum velocities reported were as follows: Macon, 32 N.; Hatteras, 40 N.; Kittyhawk, 52 N.; Cape Henry, 43 NW.; Del. Breakwater, 45 NW.; Cape May, 56 NW.; Wood's Holl, 28 NW.; Shoreham, 36 NE.; Barnegat, 48 W.

INTERNATIONAL METEOROLOGY.

Three International charts accompany the present REVIEW. No. IV is for the month of *December*, 1880. In lieu of charts Nos. V and VI for the month of *May*, 1879, which would have appeared with this issue if the regular order of publication had been adhered to, charts No. V for the months of *January* and *February*, 1877, are presented. The delay in the publication of the May, 1879, number of the "Monatliche Uebersicht der Witterung" of the "Deutsche Seewarte," is the reason for this change, that publication containing much valuable data which, previous to the month of April, 1879, was made use of in computing the mean pressure and wind-direction over the Atlantic ocean. It is therefore deemed advisable (while waiting for the above) to endeavor to complete, as well as possible, the series of charts No. V for the year 1877, by the publication of those for the eight months from January to August, inclusive. In these charts, the barometric pressure over India from January to May, inclusive, will be indicated by isobars, in broken lines, copied from the "Report on the Meteorology of India in 1877," published by the government of that country, the simultaneons observations not commencing until June, 1877.

Chart No. IV, for the month of *December*, 1880, indicates as well as is at present (February 16th, 1881) possible the general course taken by the most prominent storms over North Atlantic during that month. Nos. I, III, IV and V are continuations of low areas Nos. II, VII, XI and XV, respectively, of chart No. I for December. No. II appears to have developed during the 10th and on the morning of the 11th was central between the Bermudas and Newfoundland. These and other storms of less importance will be noticed in detail on the appearance of chart No. VI for this month. The weather over the Atlantic during this period may be characterized as very

stormy, except during the regime of an area of high barometer over the eastern portion, which set in on the 7th and continued to the 14th, the maximum pressures of the month (about 30.70 or 779.8) occurring on the 9th to the southwest of the Irish coast. The storms having their tracks charted were generally accompanied by pressures below 29.40, or 746.8, the lowest minimum barometric reading yet reported being 28.60, or 726.5, experienced by S. S. *Republic* at 4 p. m. of the 10th in about 50° N., 35° W., in connection with the storm the track of which is given as No. I.

Charts No. V.—These charts, of which two are published this month, show the mean pressure, temperature and wind force and the prevailing direction of the wind at 7.35 a. m. Washington, or 0.43 p. m. Greenwich, meantime, for the months of *January* and *February*. 1877, over the northern and at certain isolated stations in the southern Hemisphere. The chart for *January* shows an immense area of low pressure (below 29.90 or 759.4) probably covering the whole of the North Polar region and apparently extending southwards over the Atlantic Ocean to the 45th parallel. The mean pressures at the most exposed northern stations are: St. Michaels and York Factory, 29.89; Godthaab, 29.20; Stykkisholm, 29.17; Thorshavn, 29.44, and Thromso, 29.58, the lowest baro metric mean being found over Iceland. The region of highest mean pressures is found to cover quite generally the zone included between the 30th and 40th parallels over the United States, Spain and Algeria, but extending northwards over eastern Europe and Asia to the 60th. The maximum mean is that of Pekin (30.45 or 773.4), giving a barometric range in the mean monthly pressure of 1.28 inches; Barnaul is 30.44 and Shanghai 30.43. The highest and lowest barometer readings, reduced to sea-level, reported by co operating observers during the month, were, respectively: Barnaul, 31.21 or 792.7 on the 9th, and Stykkisholm, 28.03 or 712.0 on the 13th, showing a total barometric range of 3.18 inches. In the distribution of temperature the region of greatest continued cold appears to have been over Hudson's Bay Territory, York Factory having a monthly mean of —23°, while Yeniseisk, the next in order, was only —11°. Extremely low temperatures were reported, as follows: St. Michael's, Alaska, —32.5°; York Factory, —42° and Nertschinsk —44°. Over the middle latitudes the predominating winds appear to have been *southerly*, except along the northern shores of the Gulf of Mexico and the Mediterranean where a decided northerly direction prevailed. The chart for February shows the same general features, the lowest barometric mean, 29.46 or 748.3 being at Stykkisholm and the highest 30.40 or 772.2 at Barnaul, giving a barometric range in the monthly mean pressures of 0.94 inch. The highest and lowest barometric readings were 30.85 or 783.7 at Barnaul on the 21st and 27.91 or 708.8 at Stykkisholm on the 1st, giving a total barometric range of 2.94 inches. The region of greatest continued cold is found over Behring's Sea; St. Michael's —26.5°. At this station the extremely low temperature of —50° was observed on the 19th. The predominating winds were *northerly* in America, Algeria and along the eastern coast of Asia, and *southerly* over Europe and western Asia. In comparing these two months, the most marked changes are found to be a large increase of pressure during February over the northern portions of America and the Atlantic, with an increase in temperature at York Factory of 18° and at Stykkisholm of 11°, and a decrease at St. Michael's of 27°. The greatest change in barometric pressure, however, is found over Russia, where a decrease of more than 0.40 in. occurred at Dorpat, Moscow, Kieff and Orenburg. The changes in temperature over Europe were small compared with those given above, but in Asia an increase of 10° occurred at Nukuss and 11° at Yeniseisk.

TEMPERATURE OF THE AIR.

The mean temperature of the air for January, 1881, is shown by the isothermal lines for the month on chart No. II. The table in the right-hand corner of this chart gives the average temperature for January in the several districts, determined from the Signal Service observations; the mean temperature for January, 1881, and the amount of departures from the mean in the last column. It will be seen from this table that the average temperature of the month has been below the normal in all districts east of the Rocky Mountains, and also in the southern districts on the Pacific coast, where it has averaged from 1°.3 to 2°.5 below. The greatest departures occurred in Texas, and northward to British America, and northeastward over the Lake region, where the temperature has ranged from 6°.5 to 9°.0 below the normal of the month. On the Pacific coast the temperature has averaged 3°.5 above the normal in the central districts, about normal in the northern district and 3°.5 above in the region of Salt Lake. The departure from the normal temperature has been greater than during the preceding month, which was the coldest, as compared with records of previous years since the establishment of the Signal Service. This month has been the coldest ever observed in the northern and eastern districts, excepting that of January, 1875; while in the Southern States, east of the Mississippi, the only years showing a lower temperature, were those of 1872 and 1873. At Washington, D. C., the average temperature was lower than that of any preceding January of which this office has any reliable record.

Deviations from Normal Temperatures.—Under this head, the departures, as indicated by reports from regular Signal Service stations are shown in the table of average temperatures on the right-hand side of chart No. II. The following interesting items from voluntary observers are of much importance in connection herewith: *California:* Oakland, mean temperature of month 3°.0